Spring 2004

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NSU Oceanographic Center

Nova Southeastern University
Oceanographic Center

Currents

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Searching the Depths: Deep-Water Ecology Class Returns from Successful Expedition, by Charles Messing, Ph.D.

The Straits of Florida—the arc-shaped body of water that separates Florida, the Bahamas, and Cuba—lies right outside the door of the Nova Southeastern University Oceanographic Center and represents an oceanic crossroads. Waters from the Gulf of Mexico, North Atlantic, Caribbean Sea, and South Atlantic combine here to form the powerful Florida Current, the headwater of the Gulf Stream. Here, the vast limestone platforms of the Florida Peninsula and Bahama Banks abut the tectonically active Antillean Arc. The combination of hydrodynamics and geology generate a complex environment that represents the biologically richest area of the Western Atlantic Ocean. The straits are a zoogeographical Grand Central Station. In shallow waters, coral reefs find their northernmost reach along the United States east coast. In deeper water, marine species characteristic of New England and Virginia slopes reach their southern terminus. The Pourtalès Terrace, a great triangular limestone shelf that extends out from the Florida Keys halfway to the Bahamas, supports a fauna found nowhere else.

Jeffrey Mackin, Tony Crease (behind Mackin), and Kevin Lasagna launch the Cape Town dredge.

This is the environment that Deepwater Ecology of the Straits of Florida (OCMB-6325/MEVS-5010), a new addition to the NSUOC course listing, set out to explore. Taught by Professors **Charles Messing** and **Richard Spieler**, the course began with a weekend of lectures on the history, geology, physical oceanography, and ecology of the straits. But, that was just preparation. On the evening of April 20, Spieler and Messing and half the class boarded the Florida Institute of Oceanography's *R/V Bellows*, conveniently moored for the purpose next door at the U.S. Navy's brand-new deepwater seawall dock, thanks to Bill Venezia. They were about to spend a few days dredging and trawling the deep floor and midwaters of the straits to discover directly the reportedly rich fauna of the depths.

Their equipment included a variety of gear suited for sampling different environments: a 30-foot otter trawl for sandy and muddy seafloors; a heavy iron Cape Town dredge for rocky bottoms, and an Isaacs-Kidd Midwater Trawl (IKMT) for collecting, as its name suggests, organisms between the surface and sea floor. While the first two devices are common and widespread pieces of oceanographic equipment, the third is less well known. It consists of a long slender cone of netting that looks like a great green wind sock about 40 feet long, ending in a white finger of plankton net. The mouth, about six feet across, is held open by a steel bar across the top and a steel V-shaped vane across the bottom. Before the advent of electronically controlled nets (which could be deployed closed, opened at a signal from

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the ship when they reached the desired depth, and closed again on ascent), marine biologists often could not tell at what depth in midwater they had caught the different animals that blundered into their nets. The IKMT was a step toward solving this problem. The steel vane's design permitted those on deck to compute the depth of the net from the speed of the ship, the length of cable laid out, and the angle of the cable as it entered the water. If you left the net down for, say, an hour and a half at 500 meters, and took only 20 minutes each to deploy it and retrieve it, you would know that most of the catch came from 500 meters. When you repeated this at, say, 400 meters, most of what you caught might be the same as those few things collected on the way up during the previous deeper trawl. But the organisms resident at 500 meters would be missing from the shallower collection.

The *R/V Bellows* steamed south overnight to reach a broad swathe of sandy bottom off the northern end of the Florida Keys. In the morning, the otter trawl was put over the side in about 345 meters and dragged the bottom for 40 minutes. Its return to the surface provoked great excitement on deck because the cod (closed) end of the trawl was bulging with a rich haul. As the cod end knot—a series of interlacing slipknots—was released, a great mass of life poured into a large tub on the deck. Everyone gathered around and began sorting (after being admonished to use tongs instead of hands in case the catch included scorpion fishes, electric rays, sea urchins, and other potentially unpleasant organisms). The catch proved enormously rich and included more than a dozen species of crustaceans and another dozen species of fishes, most of which, to Spieler's great delight, were new additions to the NSUOC fish collection: spider crabs, armored shrimps, squat lobsters, jonah crabs and langostinos, grenadiers, hakes, beardfishes, cat sharks, duckbill flatheads, sea toads, and round batfishes. Messing realized that the catch also included more than 20 specimens of a stalked crinoid, or sea lily—*Democrinus conifer*—a delicate, little, yellow palm tree of an animal related to sea stars that represent his particular research subject. He acknowledged that he knew they lived in this area, but getting so many in such excellent condition was a great surprise.

Second leg crew: (L-R front): Kevin Lasagna, Sandra McClung, Stacy Prekel, Melody Fischer, Eileen Kelly, Marissa Magrino, and Tony Crease. (L-R back): Danica Walcutt, Charles Messing, and Jeffry Mackin.

*Marissa Magraino shows off two specimens recovered from the otter trawl: a large jonah crab (*Cander borealis*) and a smaller deepwater swimming crab (*Bathynectes longispina*).*

Rough weather reduced the amount of work that could be done, and the next trawl retrieved little more than a corroded aluminum ship's gangplank, although a few interesting mollusks and anemones were found clinging to it. Although the Cape Town dredge came up empty, the IKMT, deployed in about 250 meters, brought back a diverse collection of plankton, numerous thimble jellies, and a few small midwater fishes, including gonostomatid bristlemouths—also new additions to the collection.

The first leg of the cruise ended on April 23, and the other half of the class boarded with great excitement when they heard about the success of the first leg. This time, the ship steamed north to compare the habitats off northern Broward and Palm Beach counties with those sampled to the south. The bottom hauls were not as rich this time out, but still retrieved some of the same crustaceans and fishes, as well as a good collection of sea stars. The most interesting catch on this leg was that brought aboard by the IKMT after more than an hour in 400 meters of water. This time, the cod end produced large purple *Periphylla medusae*, elephant-trunked and tube-eyed heteropods (elongated, carnivorous, shellless snails), giant red copepods, krill, opossum shrimps, fat arrow worms, and a host of other gelatinous plankton. A handful of beautiful but odd hatchetfishes also spilled out of the net. They were accompanied by more bristlemouths—slender and sardine-shaped, but far more delicate and with great gaping V-shaped mouths and rows of light

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Professors Spieler and Messing celebrate new additions to the NSUOC teaching collection: a grenadier (or rattail fish) and a stalked crinoid (or sea lily).

People on the Move

It has been a busy winter for sea turtle workers. At the end of January, the Marine Turtle Permit Holder's Meeting was held in Orlando. NSU project manager **Stefanie Ouellette** and eight NSUOC students—**Fred Ottman**, **Nicole Justice**, **Walt Justice**, **Mary Wozny**, **Christian Guerreri**, **Liz Fahy**, **Leslye Waugh**, and **Megan Shoff**—attended the meeting. These students have been working on the Broward County Sea Turtle Conservation Program for one or more years, or were applying for the upcoming 2004 season. The group was welcomed on January 30 to an orientation and a reception. The next day was full of lectures and presentations about statewide statistics regarding disorientations, nesting, lighting, strandings, and current research projects that were primarily funded through the sale of the sea turtle license plates and decals. In the evening, there was a social, and on Sunday, they attended a behind-the-scenes tour of Epcot's The Living Seas. Some members of the group were also fortunate enough to participate in either a snorkeling or diving tour of the exhibit tank.

The 24th Annual Sea Turtle Symposium was held in San Jose, Costa Rica, from February 22–29 and was attended by Ouellette, **Arlo Hemphill**, Fred Ottman, Christian Guerreri, Leslye Waugh, Mary Wozny, and Nicole Justice. All the students work or have worked on NSU's Sea Turtle Project for Broward County. **Jennifer Hartwig**, an NSUOC graduate who now heads up the National Save the Sea Turtle Foundation and still works on the Broward County Project, was also in attendance.

The group at the symposium banquet. Back row (l–r):Nicole Justice, Arlo Hemphill, Stefanie Ouellette, Mary Wozny, Jennifer Hartwig. Front row (l–r):Christian Guerreri, Leslye Waugh, and Fred Ottman.

M.S. candidate Hemphill, who recently left Florida to take a job with Conservation International in Washington, D.C., presented a paper for that same company and staffed a table that he let the group use to display the project's brochures. Hemphill also presented a paper titled, "From Flagships to Beneficiaries: Defying Ocean's End Global Agenda for Action and Its Implications for Sea Turtles." The paper was coauthored by Sylvia Earle, Linda Glover, and Roger McManus.

The 2004 sea turtle season got under way March 1 and will continue through September. This is the third and final year of NSUOC's three-year contract with Broward County to conduct the conservation program. Personnel include 15 returning workers, 7 new workers, and 5 alternates. **Alicia Beltran** returned for her second year as the project's assistant manager, and **Curtis Burney**, Ph.D., is once again the faculty supervisor for the project. New workers and alternates each undergo a three-day individual training, which began on April 26. As of April 27, they had found three leatherback nests and three loggerhead nests. It seemed like the season had started off unusually slow this year, but with the loggerhead nests all occurring in the last week of April, it seems like it will pick up quickly. Since this is an even year, a very high number of nesting green turtles is expected, as seen by their alternating nesting patterns over time.

Mahmood Shivji, Ph.D., gave invited seminars entitled "Molecular Approaches to Shark Conservation" at the University of South Florida and Mote Marine Laboratory on March 25–26.

Edward O. Keith, Ph.D., and a number of NSU graduate and undergraduate students attended the 12th annual

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organs along their flanks. Bristlemouths are the most abundant vertebrate animals on earth, surpassing in numbers every species of fish, bird, amphibian, reptile, and mammal.

More rough weather, including a few eight-foot swells taken on the beam, forced an early departure for Fort Lauderdale on the morning of April 25, but Captain Tom Worley and First Mate Larry Braun handled the ship with expert care. The following weekend, the class met at NSUOC to go through the collections, and Spieler and Messing introduced them to the arcana of taxonomy. Attempting to identify any organism to species that does not belong to a group well known to non-scientists (e.g., birds, mammals, butterflies) requires learning the equivalent of a new language. The terminology is complex, the characters often obscure, and the writing sometimes convoluted. Nevertheless, the class pitched in, and by Sunday afternoon, many of the fishes and crustaceans had been identified. The specimens will now be added to the NSUOC collection and will contribute to teaching future students about this extraordinary environment.

The students who participated were **Gene Crease**, **Lindsay Dreger**, **Kristina Evans**, **Melody Fischer**, **Eileen Kelly**, **Kevin Lasagna**, **Jeffrey Mackin**, **Marisa Magrino**, **Sandra McClung**, **Stacy Prekel**, **Rebecca Raffel**, **Stephanie Rogers**, **Karen Schanzle**, **Danica Walcutt**, **Brad Wimmer**, and **Laura Wright**.

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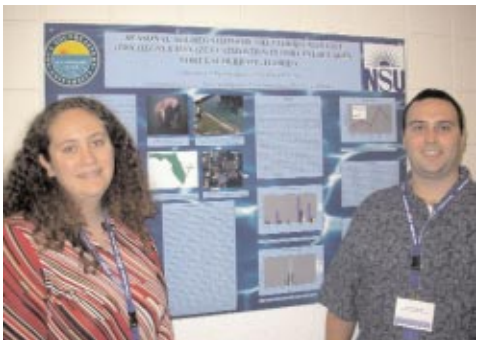
Southeast and Mid-Atlantic Marine Mammal Symposium held March 26–28 at the Harbor Branch Oceanographic Institution in Fort Pierce.

NSUOC graduate student **Jaime Hilliard** presented a poster titled "Seasonal Aggregations of the Florida Manatee (*Trichechus manatus latirostris*) in Port Everglades, Fort Lauderdale, Florida," describing her thesis research on the seasonal abundance of Florida manatees in Port Everglades. Manatees congregate in Port Everglades during the winter because of the warm water effluent from a Florida Power and Light electricity generating plant there. The poster was coauthored by Keith and M.S. student **Ryan Goldman**.



Jaime Hilliard and Ryan Goldman with their poster

Jennifer Scharnitz with her poster

Lindsey Fulcher with her poster

Back Row (l–r):Jessie Watters, Joe Hall, Christina Stylianos, Michele Morgado, Fred Ottman, Jackie Hernandez, Brendan Bray, Stefanie Ouellette Front Row (l–r):Karen Schanzle, Laura Wright, Jim Thomas, Nikki Roddy, Melinda Bigelow, Sarah Maurer, Stephanie Rogers at Fort George Radison in Belize City before returning to the United States.

M.S. student **Jennifer Scharnitz** presented a poster coauthored by Keith titled "Preliminary analysis of the vocalizations of the pygmy sperm whale, *Kogia breviceps*," describing her preliminary work on the acoustics of the pygmy sperm whale.

Lindsey Fulcher, an undergraduate student from the Farquhar College of Arts and Sciences, presented a poster coauthored with Keith titled "Inverse correlation between water temperature and the presence of Florida manatees (*Trichechus manatus latirostris*) at Port Everglades, Florida," describing the results of her independent study, which correlated the occurrence of manatees in Port Everglades with the temperature of the water in the FPL effluent canal.

The group getting ready to leave the island and head back to the mainland

Keith also attended the annual meeting of the Federation of American Societies for Experimental Biology, held April 17–21 in Washington, D.C. He presented a poster with several undergraduate students from the Farquhar College of Arts and Sciences as coauthors describing the latest results of his ongoing research project examining the adhesion of tear proteins to contact lenses.

The 2004 Belize Course took place from March 28–April 4. Twelve NSUOC students and one NSU undergraduate participated in the course, led by **Jim Thomas**, Ph.D. The group stayed on an island known as South Water Caye, where the International Zoological Expedition (IZE) is located. The students were housed on the island in dorm-style housing for the entire week. Daytime was filled with lectures and all-day snorkeling expeditions where the students work together to create reef characterizations of two different reefs: South Water Caye and Whale Shoals. They were required to create species lists of fish, invertebrates, corals, and algae at each reef and in the various zones of the reefs. Evening time was for classroom work where the day's work was compiled, maps drawn, reports written, and student presentations were given. Most of the students also participated on one or two dives during their

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free time. Some visited Carrie Bow Caye, which is close to South Water Caye and is the location of the Smithsonian Field Research Station. At the end of the week, they took a bus ride through the rainforests of Belize and stopped at Belmopan, and then on to Belize City for the last night before returning to the United States.

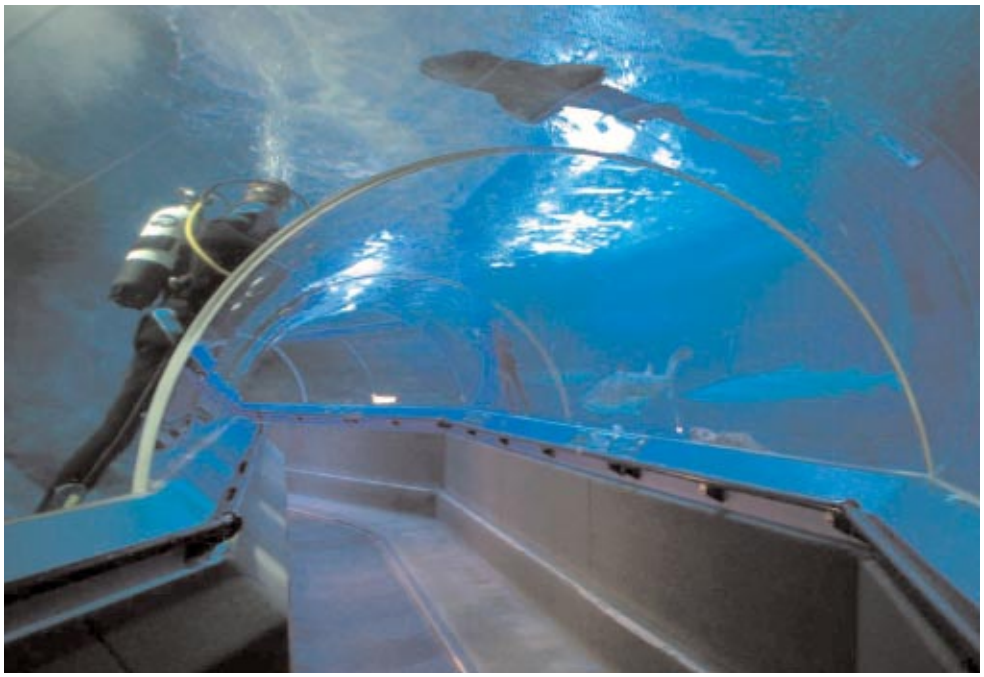
Veljko Dragojlovic, Ph.D., gave a talk at the American Chemical Society National Conference and Exposition held March 28–April 2 in Anaheim. Titled "Nature of the Co-oxidant in Catalytic Ruthenium Tetroxide Oxidations," this work was supported by the President's Faculty Research and Development Award 2003/2004.

Kathy Maxson, the center's librarian, attended the annual SAIL (Southeast Affiliate of IAMSLIC) Conference at the University of Texas at Austin's Marine Laboratory in Port Aransas, May 11–13. The conference was titled, "Getting more with less: How to be 'lean and mean' machines in sustainable seas."

The keynote speaker was Sylvia Earl, Ph.D., a well-know deep-sea researcher who is the Program Coordinator for the Harte Research Institute for Gulf of Mexico Studies and the explorer-in-residence for *National Geographic*. Earle's talk was titled "Deep-Sea Dives in the Gulf of Mexico."

(L-R) Myuki (Liz) DeHart; Sylvia Earl, Ph.D.; and Kathy Maxson

The SAIL group aboard the R/V Katy *about to head out for a cruise.*



Oceanworld Manly divers in the shark tank outside visitor walkway

Berkle in Torres del Paine National Park, Patagonia, Chile

M.S. student **Megan Berkle** went around the world in six months, visiting 13 countries, 4 continents, and Hawaii. The purpose of her journey was to write a global marine resource guide. This is a comprehensive, but detailed, list of all the nonprofit organizations, aquariums, laboratories, and marine science departments worldwide. Berkle visited facilities throughout South Africa, Thailand, Australia, and Hawaii. In South Africa, she went to Two Oceans Aquarium (Cape Town), Stoney Point Nature Reserve and Boulders Beach (penguin colony), University of Cape Town Marine Biology Department, Port Elizabeth Aquarium, East London Aquarium, and Sea World (Durban). In Thailand she visited the Kho Samui Aquarium and the Kho Phangan research station. In Australia she checked out the Reef HQ Aquarium (Townsville), James Cook University Marine Biology Department (Townsville), the Sydney Aquarium, and Oceanworld Manly, and in Hawaii she stopped at the Waikiki Aquarium.

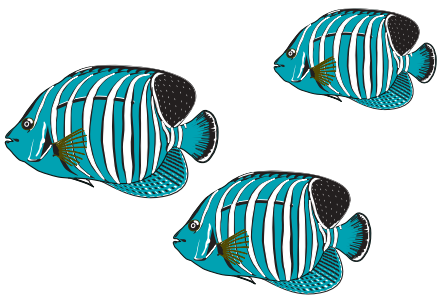
Other News

NOAA's Coral Programs Meet

For a second year, all of the coral reef programs coordinated under the umbrella of the National Oceanic and Atmospheric Administration's (NOAA) Center for Sponsored Coastal Ocean Science (CSCOR) met together to find out what the other programs are doing, as well as to be updated on NOAA procedural changes. Hawaii Coral Reef Initiative (HCRI) Research Program at the University of Hawaii hosted this year's meeting in April. NCRI Executive Director **Richard E. Dodge**, Ph.D.; Associate Director **Bernhard Riegl**, Ph.D.; and Coordinator of Administrative Operations **Carol Fretwell** represented NCRI at the meeting. The University of Puerto Rico hosted the meeting last year. NCRI is scheduled to host it next year.

"5 Percent Day" Nets Dollars and Local Name Recognition

Our National Coral Reef Institute (NCRI) was the cover story for the April issue of the Whole Foods Market Plantation monthly newsletter. Of chief interest (to us!) was that employees of the store had nominated NCRI to receive 5 percent of net sales on Tuesday, April 27, from 8:00 a.m. to 10:00 p.m. An information table was set up in the store, displaying the many activities of NCRI, as well as a supply of informational brochures about South Florida's coral reefs and NCRI brochures for distribution. More than a hundred brochures were given out during the day. We'll have to wait to see how much was raised. A BIG thank you to all who stopped by and shopped on NCRI's "5 Percent Day."



"OCEAN" Was Topic of the Day

"Oceans Day 2004" in Tallahassee drew more than the usual constituents of the Florida Institute of Oceanography and the Florida Ocean Alliance this year. Dovetailing with the release of the Ocean Commission Report to state governors, a ceremony took place on the capitol steps, including Governor Jeb Bush; Frank Muller-Karger, member of the Ocean Commission; and Tim Keeney, deputy assistant secretary of commerce for oceans and atmospheres, among the dignitaries. NSUOC and NCRI were represented at Oceans Day by an exhibit staffed by Dean **Richard E. Dodge**, Ph.D., and **Carol Fretwell**, NCRI coordinator of administrative operations.

Members of the Florida Ocean Alliance (FOA) Board and Governor Jeb Bush release the Commission on Ocean Policy Report on Oceans Day in Tallahassee on April 21.

Fleet Week

Faculty members, staff members, and students got a front row seat when the ships came in and left again for Fleet Week, April 26–30. Among the ships that were in port were the *U.S.S Enterprise* (CVN-65), *U.S.S. Mitscher* (DDG-57), *U.S.S. Philippine Sea* (CG-58), *U.S.S. Simpson* (FFG-56), *U.S.S. Stephen W. Groves* (FFG-29), the *U.S.S. Trenton* (LPD-14), and the submarine *U.S.S. Miami* (SSN-755). Fleet Week was followed up with the McDonald's Air & Sea Show, May 1–2.

The U.S.S. Enterprise

Ship Grounded off Port Everglades

Once again a ship grounded near Port Everglades on March 26. The *Eastwind*, a Greek-flagged freighter carrying bauxite and oil, ran aground during rough seas, destroying thousands of square feet of reef. The grounding also killed a federally protected loggerhead sea turtle whose crushed remains were found by divers.

This is not the first grounding in the area. In June 2003, the *Alam Senang*, a 585-foot Malaysian cement carrier, ran up on the second reef from shore near Fort Lauderdale Beach, dislodging hundreds of hard corals, as well as soft corals and sponges. In February 1998 the *Pacific Mako*, a 428-foot freighter owned by a Cayman Islands company, was caught in the anchorage in a powerful storm, causing it to drag its two anchors over the reefs toward shore also near Fort Lauderdale Beach. This grounding dislodged corals as well as causing the destruction of part of the underlying limestone structure of the reef.

The following month, heavy winds and stormy seas pushed the *Hind*, a 348-foot Panamanian freighter that was parked in the anchorage outside of the port, toward shore and caused it to drag its anchor. The grounding scraped clean parts of one reef, grinding the coral to rubble.

Brian Walker and Brian Ettinger check out damaged coral on grounding site.

The reefs are not only valuable biologically, but they provide a vital benefit to the region's economy, attracting thousands of people for recreational diving, fishing, and snorkeling. NSUOC's National Coral Reef Institute (NCRI) is actively involved in the science of coral reef restoration and recovery. Hypothesis-driven projects include examining reef fish and coral recruitment, stony coral and octocoral transplantation, and the use of coral nurseries. NCRI will continue to work with resource managers and resource users to determine the best approach for restoration and recovery following ship groundings and other physical impacts to our coral reefs.

Shining Stars in a Sea of Technology

Members of the Oceanographic Center walked away with two first place entries at NSU's Seventh Annual Technology Fair, held on main campus April 30. Representing the OC and the National Coral Reef Institute, **Bernhard Riegl** and **Ryan Moyer** took first place in the faculty division with their "Acoustic Seafloor Mapping" entry. In the professional division, **Kevin Helmle** and **Kevin Kohler** took first place with their entry, "Coral X-Radiograph Densitometry System: Coral*XDS*."

The theme of this year's Technology Fair was "Adventures on Technology Island," and the OC staff fit right in, involving the center's research vessel *Surveyor* as part of their display. For their efforts, each first place team walked away with a medal and cash prize. The Technology Fair is an annual event sponsored by NSU's Office of Information Technologies and Media Services Technology Training Services and is a good opportunity for Oceanographic Center faculty and staff members to showcase the application of technology in their given area of research.

Kevin Kohler and Kevin Helmle man their award-winning multimedia presentation at NSU's Technology Fair.

(L-R) Kevin Helmle, Bernhard Riegl, Ryan Moyer, and Kevin Kohler stand proudly in front of the R/V Surveyor *at NSU's Seventh Annual Technology Fair.*

Ryan Moyer (left) and Bernhard Riegl (center) explain the principles of Acoustic Seafloor Mapping to an attendee of NSU's Technology Fair. Also pictured is NSUOC M.S. student Daniel Bogorff (seated).

MASTERCURRENTS
INSTITUTE OF MARINE AND COASTAL STUDIES

Summer Semester
July 6–September 17

Marine Chemistry
OCOR-5605
This course is one of the five core courses required for all master's specialties. The class will review the properties and composition of seawater; the importance, distribution, relationships, and cycling of major nutrients; dissolved gasses; trace metals; and organic compounds. A self-paced laboratory is included in the course activities. Problem solving is supplemented with interactive microcomputer work. **Starts July 7. Lab Fee: $40.** Instructor: Curt Burney, *burney@nsu.nova.edu*

Coral Reef Biology and Ecology
OCMB-7012
The purpose of this class is to introduce students to the general biology and ecology of corals and coral-associated organisms. Topics will include a historical perspective of coral study; coral distribution, diversity, and abundance; coral taxonomy; reef types and morphology; zooxanthellae symbioses; reproductive ecology including recruitment and dispersion of larvae and propagules; coral reef trophic systems; natural and anthropogenic perturbations; coral adaptation and evolution; corals as a source of proxy records; rapid reef assessment techniques; and coral reef resource management. Active classroom discussion will be encouraged during and following the presentation of material by the professor. A formal discussion period on selected papers will be conducted during each class. Material will be presented from a global perspective, with focus on the South Florida and Caribbean marine environment. Two weekend field trips are planned to allow the student to directly experience the local coral reef and coral community habitats. Meets Mondays. **Starts July 12. Lab fee: $15.** Instructor: Joshua Feingold, *joshua@nsu.nova.edu*

Ecosystem Management
CZMT-0670/MEVS-5015
Ecosystem management has gained widespread visibility as an approach to achieve sustainable and responsible natural resource use. With an increased interest in this emerging management paradigm, this course will explore interactive relationships among organisms, community structure, and the application of emerging technologies, including GIS and remote sensing, relative both to ecology and management. A case study of the marine environment of the Bahamian Archipelago, and the application of the sciences of ecology and conservation biology to real-world concerns, will help demonstrate how scientific research significantly reduces uncertainty and improves resource management decisions. Starts **July 6. Lab fee: $10.** Instructor: Stefan Harzen, *harzen@taras.org*

Tropical Marine Fish Ecology
OCMB-6120/CZMT-6090
This course will cover the ecology of tropical fishes, including coastal, estuarine, mangrove, and pelagic fishes. Emphasis is on identification of local species. Current theories on distribution and abundance will be discussed in addition to ecological theory. Field work will take place at the Keys Marine Laboratory, Long Key, Florida. On return to the Oceanographic Center, self-directed and self-scheduled laboratory study will be required. **July 26–August 1 field course. Lab fee: $375. Limited to 20 students.** Instructor: Richard Spieler, *spielerr@nsu.nova.edu*

Taxonomy of Marine Invertebrates,
OCMB-6085
(subject to change)
This course will cover the taxonomy and ecology of marine invertebrates (emphasizing shallow tropical western Atlantic species) and train students in their identification. Field work and a self-paced laboratory are integral to the course. Class includes a weeklong field trip to the Keys. August field course, dates TBD. **Lab fee: $350**. Instructor: Charles Messing, *messingc@nsu.nova.edu*

M.S. degree specialties are marine biology, coastal zone management, physical oceanography, and marine environmental sciences. Each course carries three credit hours or may be audited. Tuition is $567 per credit hour (50 percent less for audit). Classes meet once a week from 6:30 to 9:30 p.m. at the Oceanographic Center (unless otherwise specified). The summer term runs from July 6–Sept. 16, 2004 (unless otherwise specified). Registration ($25 nonrefundable fee) is June 14–July 9. For further information, call Andrew Rogerson, Ph.D., or Melissa Dore at (954) 262-3610 or 800-396-2326, or email *imcs@nsu.nova.edu*. More information can be found at the Web site *www.nova.edu/ocean/*.

New/Continuing OC Grants as of February 19 and April 23 included

Continuing:

Richard Dodge, Ph.D., URS Corporation, Studies on Natural Gas Pipeline effects.

Curtis Burney, Ph.D., was awarded a grant from the Broward County Commissioners to run the Broward County Sea Turtle Conservation program for 2004 in the amount of $137,375.

New:

Edward O. Keith, Ph.D., was awarded a grant from the Florida Fish and Wildlife Conservation Commission Manatee Avoidance Technology Program, 2004, to support his research on the "Development of an underwater infrared camera to detect manatees." This was one of only three grants in this program awarded this year. Total funds awarded $18,944.

Alexander Yankovsky, Ph.D., Arizona State University, Coupled Physical Numerical Models of nonlinear interaction. More in-depth information on this study will be in the Summer *Currents*.

Distance Education courses

Coastline Environmental Security: New perspectives on threats to the natural environment
CZMT-0677
In the post-September 11, 2001, global theater, there is a widely held perception of new threats facing democratic societies. Traditional terrorist targets include human assets such as political leaders and foreign diplomatic staff; physical assets such as aircraft, buildings, factories, and power stations; and institutional assets such as legislatures and courts of law. We seek here to expand the notion of threat beyond these traditional determinants to include the coastal environment, domestically and internationally.

Specifically, but not exclusively, we will consider:

1. What is environmental terrorism?
2. What are coastal environmental assets?
3. Possible security countermeasures that could be used to reduce or eliminate threats to environmental assets.
4. The costs and benefits of employing countermeasures and their feasibility considering the desire for an open and free society.

Instructor: Scott White

Marine Geology
OCOR-5604
The objectives of the course are (1) to enable students to examine the structure, evolution, and stratigraphy of the ocean basins and continental margins and (2) to provide an understanding of the dynamic processes that shape the surface of the earth under the ocean surface. Instructor: Bernhard Riegl *(Please note: For CZM students only)*

Internship in Coastal Policy
CZMT-0664
Students enrolled in this course are expected to invest the equivalent of three hours per week for 14 weeks (i.e., at least 42 hours) in their internship. This can be done at a research organization; private company or consulting firm; local, county, state, or federal agency; or other approved venue that is related to coastal zone activities. In addition to hands-on work, each intern will also keep an academic journal of internship activities. The journal will be submitted for review for the final grade. The student's supervisor at the internship venue will also evaluate the student. Permission and approval of supervising professor is required before you enroll in this class. Instructor: Steffen Schmidt

Marine Mammal Management
CZMT-0667
An interdisciplinary approach to people and the environment—as this has evolved over time and as it stands today—this course examines the present state of the relationship with marine mammals along with what it is likely to be for the future, whether by default or design. The marine mammal and environment relationship is extremely complex and fluid. It changes depending upon place and time, and the rate of this change is accelerating along with related developments such as population and economic growth, technological capacity, and our expanding use of the world's oceans and waterways. We will look at the position and influence of marine mammals within the environment, as well as the development of physical conditions, values and economic activities that have led to their present situation. Instructor: Keith Ronald (minimum of 10 students needed)

Fall Term September 27–December 17

Marine Ecosystems, OCOR-5602
Instructor: Curt Burney

Biostatistics I, OCOR-5603
Instructor: Mark Farber

Scientific Diving and Coral Reef Assessment, OCMB-9700
Instructors: David Gilliam/ Lance Robinson

Physical Oceanography, OCOR-5607. Instructor: Sean Kennan

Marine Mammals, MEVS-5016/ OCMB-6340. Instructor: Edward Keith

Fluid Mechanics, MSPO-TBA.
Instructor: Alexander Soloviev

Ph.D. Degree Offered

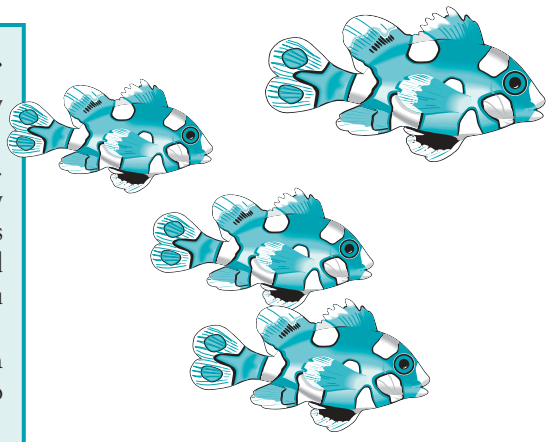
The Oceanographic Center offers a doctoral degree in oceanography/ marine biology. The program requires a minimum of 90 credits beyond the baccalaureate. At least 48 credits must consist of dissertation research, and at least 42 credits must consist of upper-level coursework. Required courses include the four M.S. core courses. Other upper-level coursework is usually in the tutorial mode with the major professor. Tuition is $3,868 per quarter.

Notice to all Oceanographic Center Students: A Change in the Core Requirements.

To cope with the diverse background of our students, we have initiated a new section of Biostatistics.

Biostatistics I is intended for students with little or no background in statistics. Biostatistics II is intended for students with previous statistical experience. To satisfy core requirements, only one of these courses need be completed. However, students who feel that they would benefit, can take both Biostatistics I and II, with the second course counting as an elective. (Note: If you have previous statistical experience, you cannot take Biostatistics I.)

Biostatistics I will be offered in the fall term, and Biostatistics II will be offered in the spring term. Students who are unsure of their capabilities are encouraged to contact the instructor, Mark Farber, at *mfarber@nsu.nova.edu.*

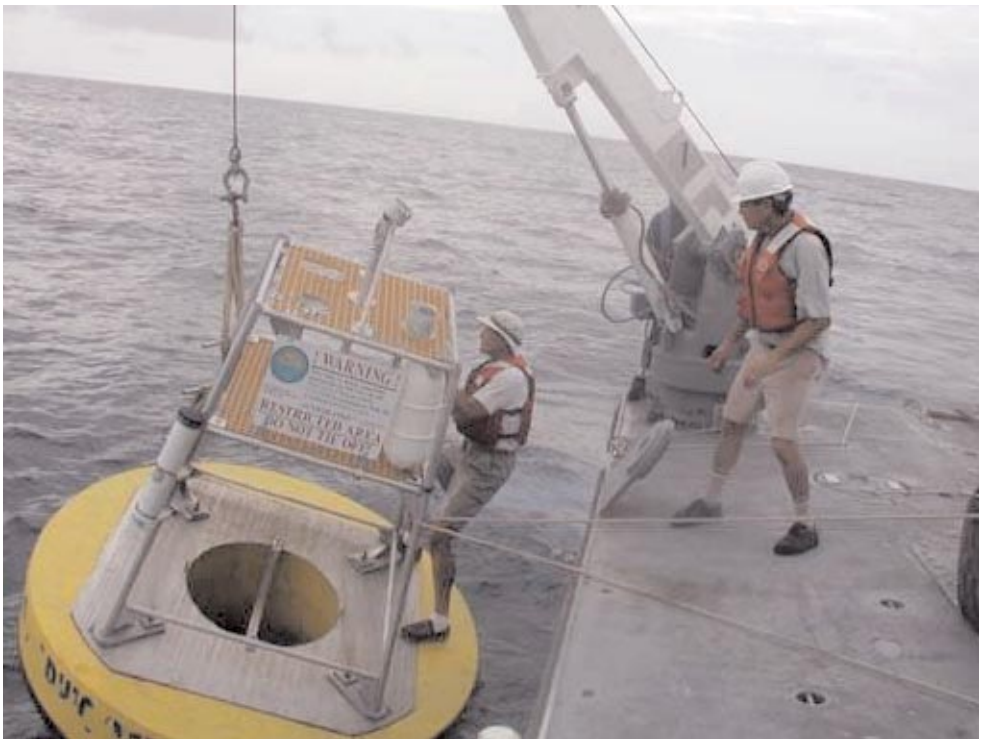


New Master's Degree in Physical Oceanography Being Offered

The Oceanographic Center has received approval to offer a new master's degree in physical oceanography (MSPO). The first MSPO class begins in October 2004. NSU has a rich tradition in physical oceanography: the Oceanographic Center was first directed by a renowned physical oceanographer, William Richardson, Ph.D., and has long been one of the leading research centers for physical oceanography. Current faculty members conduct research in many areas of physical oceanography, including: global, tropical, and coastal circulation; air-sea interactions; dynamic modeling; and relations to climate and marine ecosystems.

The MSPO is flexible, with two tracks—a research track and a non-research track—so students can choose to study to become a professional researcher or to apply their expertise in the corporate, government, or private sectors. Classes are held at the Oceanographic Center in the evenings. The curriculum covers the wide range of topics needed for a physical oceanography degree. Students will learn about the dynamics of the ocean currents; coastal regions; instrumental methods; satellite oceanography; and the biology, geology, and chemistry of the oceans.

The distinguishing factor between the M.S. in physical oceanography and the other M.S. degrees at the Oceanographic Center is the emphasis on ocean physics. Thus, in addition to fulfilling the normal requirements for acceptance to the M.S. programs, students should have a basic mathematics background including a year of calculus. Physical oceanography is the uniting discipline in oceanography—all oceanographers need to appeal to the ocean dynamics and currents to understand oceanic processes.



Deployment of a surface mooring as part of the South Florida Ocean Measurement Center (SFOMC) project, a cooperative program involving NSU oceanographers (courtesy A. Soloviev).

For more information, see our Web site at *www.nova.edu/ocean/mspo/* or contact the M.S. in physical oceanography program coordinator, Sean Kennan, at *skennan@nsu.nova.edu.*

Defenses

THESIS

Irene Arpayoglou, "Cultivation of Wrack Collected Seagrasses." Committee members: Stacy Myers, South Florida Water Management District; Curt Burney, NSUOC; Carman N. Vare, environmental program supervisor, Department of Environmental Resource Management (DERM). March 12

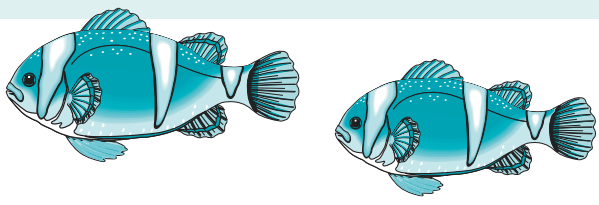
Courtney Campbell Arena, "Electro-ionization technology as a treatment for ballast water with a review of potential methods used to verify treatment." Committee members: Andrew Rogerson, Don McCorquodale, and Curtis Burney. April 8

Neil Hammerschlag, "Factors Affecting Predatory Success of White Sharks (*Carcharodon carcharias*) at Seal Island in False Bay, South Africa." Committee members: R. Aidan Martin, ReefQuest Centre for Shark Research; Edward O. Keith, NSUOC; and Mark I. Farber, Adjunct NSUOC. May 24

Publications

Cash, D., A. Combs, and **V. Dragojlovic** (2004). Cobalt-catalyzed photolytic ethoxycarbonylation of bromoalkanes in the presence of a Lewis acid, *Tetrahedron Lett.* 45 (6), 1143-1145. (Daniel Cash and Angela Combs were NSU undergraduate students. Both of them are currently enrolled in NSU's osteopathic medicine (D.O.) program. The work was supported by a President's Faculty Scholarship Award 2000/2001.)

Keith, E. O., O. Lo, T. Siddiqui, S. Dixon-Banks, and A. Janoff (2004). A Comparison of Albumin and Lysozyme Adhesion to the Four Types of Contact Lens Materials. *FASEB J.* 18(5):A1235.



Conservation Genetics Laboratory Studies Secret Lives of Belizean Sharks

Members of the NSUOC/Guy Harvey Research Institute (GHRI) Conservation Genetics Laboratory **Demian Chapman**; **Debra Abercrombie**; **Vince Richards**; and **Mahmood Shivji**, Ph.D.; recently returned to Glover's reef atoll, Belize, to continue work on the local shark population. This year, in collaboration with scientists from the Pew Institute for Ocean Science (PIOS), and with funding from the Wildlife Conservation Society (WCS) and the Sea-star Foundation, they were seeking to surgically implant coded-telemetry transmitters ("pingers") into the body cavities of nurse, *Ginglymostoma cirratum*, and Caribbean reef, *Carcharhinus perezi* sharks. Once "pingered" the ocean predators would then be released to go about their daily lives, where an array of bottom-mounted receivers built by the team would track their movements over periods of one to two years and help reveal their degree of residency, space-utilization patterns, and habitat requirements. Pingering a shark is no easy task, however. First the shark must be captured using a baited hook and then brought close to the 21-foot workboat where a lasso is used to snare its tail. The sharks, some of which are almost 2.5 meters long, are then restrained alongside the boat and gently rolled over so that they are upside down. This results in a state of torpor (not for the scientists) known as tonic immobility, allowing the researcher to make a small incision into the shark's ventral surface where a pinger can be inserted into its body cavity. Before the shark wakes up, medical sutures are used to close the wound and other vital biological information, such as body length, sex, and clasper length (for males) is taken. This year, the team successfully implanted pingers into 7 Caribbean reef sharks and 22 nurse sharks, and checked the data stored in the receivers for information about last year's sharks. So far, the nurse sharks seem to be showing fidelity to specific sites around the atoll, but make long nocturnal excursions, making their home-ranges very large and heterogeneous with regard to habitat. The one adolescent male Caribbean reef shark pingered last year swam past one receiver on the reef slope almost every day in the early evening, from November 1 to February 14. Since the 14th, he has apparently left Glover's, prompting the researchers to speculate that maybe he found a girlfriend and took off for Valentine's Day! The results of the study will help resource managers in the Caribbean design Marine Protected Areas (MPAs) that are large enough, and encompass enough critical habitat to maintain vulnerable shark populations.

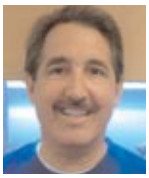
A 196-cm mature male Caribbean reef shark, named Gale after our boat captain, is drawn close to the boat for surgery. After his release, a receiver positioned a quarter of a mile east on the reef slope records Gale milling around for about two hours, starting at midnight. The next night he visited the same spot from 4:00–7:00 a.m. Continued monitoring will tell us a great deal about Gale's residency to Glover's reef, reveal his habitat preferences, and will hopefully help conservationists design effective marine parks for his species.

Friday Seminar Series for March and April

Sarah Frias-Torres, Ph.D., postdoctoral associate, NOAA. "Little sea wonders: seadragons, seahorses, and pipefishes." March 5

Keith Ronald, Ph.D., adjunct professor, NSUOC. "Mermaids, myths, and monsters…or Marine mammals and man in global commerce, conflict, and competition." March 19

Veljko Dragojlovic, Ph.D., NSUOC. "Pharma Sea Bioprospecting—collecting natural products for their medicinal properties." April 16



John Farina, Department of Environmental Resources Mangement (DERM). "Job Opportunities at DERM. Everything you wanted to know about the environment but were afraid to ask." April 23

Charles Messing, Ph.D., NSUOC. "Ancient gardens of the deep." April 30

Joel Trexler, Ph.D., Florida International University, "Metacommunity Dynamics of Fishes in the Florida Everglades." May 7

William Hamlett, Ph.D., Indian University School of Medicine. "Chondrichthian reproduction: a sexual smorgasboard." May 14

NOVA SOUTHEASTERN UNIVERSITY
Oceanographic Center
8000 North Ocean Drive
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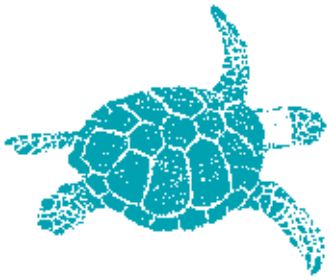
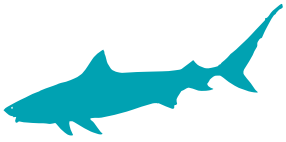
Currents, Spring 2004

Kathy Maxson, Peggy Oellrich, and Chris Barry show their support as the U.S.S. Enterprise *prepares to depart.*

The U.S.S. Philippine Sea.





Editor: **Kathy Maxson**

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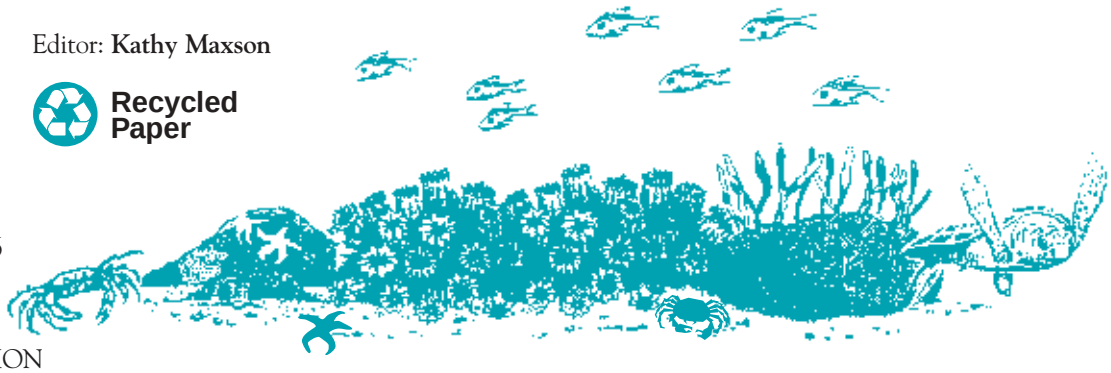

Nova Southeastern University is accredited by the Commission on Colleges of the Southern Association of Colleges and Schools (1866 Southern Lane, Decatur, Georgia 30033-4097, Telephone number: 404-679-4501) to award associate's, bachelor's, master's, educational specialist, and doctoral degrees.

05-040/04 DBB